

CLAIMS

1. An x-ray tube, comprising:

an evacuated enclosure containing an electron source and an anode positioned to receive electrons produced by the electron source;

an outer housing containing the evacuated enclosure; and

a mounting assembly configured to mechanically support the evacuated enclosure within the outer housing, comprising:

a first mounting portion that mechanically attaches to an outer surface of the outer housing; and

a second mounting portion that mechanically attaches a portion of the evacuated enclosure, the second mounting portion also being mechanically attached to the first mounting portion through an aperture defined in the outer housing.

2. An x-ray tube as defined in claim 1, wherein the first mounting portion comprises a bracket that attaches to the second mounting portion using a plurality of screws.

3. An x-ray tube as defined in claim 2, wherein the bracket is substantially composed of aluminum.

4. An x-ray tube as defined in claim 3, wherein the second mounting portion comprises a clamp having a C-shaped configuration, the clamp being substantially composed of stainless steel.

5. An x-ray tube as defined in claim 4, wherein the clamp frictionally engages a portion of a window assembly, the window assembly comprising a portion of the evacuated enclosure.

6. An x-ray tube as defined in claim 5, wherein screws are used to mechanically attach the bracket to the outer housing and to attach the clamp to the bracket.

7. An x-ray tube as defined in claim 1, wherein the mounting assembly is further configured to mechanically attach the x-ray tube to a portion of an x-ray generating device.

WORKMAN NYDEGGER
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
1000 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

8. In an x-ray tube, a mounting assembly for use in joining an evacuated enclosure containing an electron source and an anode to an outer housing that contains the evacuated enclosure, the mounting assembly comprising:

a bracket portion that mechanically attaches to a portion of the outer housing;

and

a clamp portion that frictionally engages a portion of the evacuated enclosure proximate an x-ray transmissive window that is located on a surface of the evacuated enclosure, wherein the clamp portion is also mechanically attached to the bracket portion through an aperture defined in the outer housing such that the mounting assembly supports the evacuated enclosure in a specified position within the outer housing.

9. A mounting assembly as defined in claim 8, wherein the window comprises part of a window assembly that is attached to a surface of the evacuated enclosure, and wherein the clamp portion frictionally engages a cylindrical portion of the window assembly that extends about the periphery of the window.

10. A mounting assembly as defined in claim 9, wherein the clamp portion comprises an annular ring having a radial cut defined therethrough, the cut enabling an aperture defined by the annular ring to frictionally engage with the extended portion of the window assembly such that the aperture is aligned with the window thereof.

11. A mounting assembly as defined in claim 10, wherein the bracket portion further comprises an aperture that aligns with the window and with the aperture of the clamp portion when the bracket portion and clamp portion are mechanically attached.

12. A mounting assembly as defined in claim 8, wherein the bracket portion has at least one surface that is shaped to physically engage a corresponding portion of the outer housing.

13. A mounting assembly as defined in claim 12, wherein the at least one surface of the bracket portion is a concave surface.

14. A mounting assembly as defined in claim 8, wherein the anode of the x-ray tube is a rotary anode.

15. A mounting assembly as defined in claim 8, wherein the bracket portion further comprises a circular recess in which the clamp portion is at least partially received when the clamp portion is mechanically attached to the bracket portion, the circular recess being concentric with the aperture of the bracket portion.

16. In an x-ray tube, a method of joining an evacuated enclosure to a structure, the evacuated enclosure, the evacuated enclosure including a window assembly, the method comprising:

attaching a clamp portion of a mounting assembly to a bracket portion of the mounting assembly such that an aperture defined in the clamp portion is aligned with an aperture defined in the bracket portion;

attaching the clamp portion of the mounting assembly to an extended segment of the window assembly of the evacuated enclosure such that a window located in the window assembly is aligned with the apertures of the clamp portion and the bracket portion; and

attaching the bracket portion of the mounting assembly to a surface of the structure.

17. A method of joining an evacuated enclosure to a structure as defined in claim 16, wherein attaching the clamp portion of the mounting assembly to an extended segment further includes tightening the clamp portion about the extended segment such that the clamp portion frictionally engages the window assembly.

WORKMAN NYDEGGER
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
1000 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

18. A method of joining an evacuated enclosure to a structure as defined in claim 17, wherein the clamp portion is an annular ring that defines the clamp portion aperture, the annular ring having a radial gap such that the annular ring defines a “C”-shaped configuration, and wherein the act of tightening the clamp portion about the extended segment further comprises the act of tightening a screw that passes through a screw hole defined through the gap such that the clamp portion aperture frictionally engages the window assembly.

19. A method of joining an evacuated enclosure to a structure as defined in claim 18, wherein the structure is an outer housing for containing the evacuated enclosure, and wherein the method further comprises:

after attaching the clamp portion of the mounting assembly to the bracket portion, inserting the evacuated enclosure within a volume defined by the outer housing.

20. A method of joining an evacuated enclosure to a structure as defined in claim 19, wherein attaching the bracket portion further includes:

attaching the bracket portion of the mounting assembly to a surface of the outer housing such that the bracket portion overlays an aperture defined in the surface of the outer housing.

21. An x-ray tube for use in an x-ray generating device, comprising:
- an evacuated enclosure containing an electron source and a rotary anode positioned to receive electrons emitted by the electron source;
 - a window assembly attached about an aperture formed in the evacuated enclosure, comprising:
 - a hollow cylindrical segment hermetically attached about the aperture formed in the evacuated enclosure such that at least a protruding portion of the cylindrical segment extends beyond an outer surface of the evacuated enclosure; and
 - an x-ray transmissive window positioned in the cylindrical segment;
 - an outer housing containing the evacuated enclosure, the outer housing having an aperture formed therein;
 - a mounting assembly configured to attach the x-ray tube to the x-ray generating device, comprising:
 - a clamp portion including an annular ring that defines an aperture, the annular ring having a radial cut through one portion thereof, the clamp portion aperture receiving and frictionally attaching to the protruding portion of the window assembly cylindrical segment such that the clamp portion aperture is aligned with the window; and
 - a bracket portion having a substantially planar first surface, a curved second surface, and an aperture extending between the first and second surfaces, the bracket portion being affixed to an exterior portion of the outer housing such that the bracket portion aperture is positioned over the aperture of the outer housing, the bracket portion also being mechanically attached to

the clamp portion such that the bracket portion aperture is aligned both with the clamp portion aperture and with the window, the bracket portion also being mechanically attached to a portion of the x-ray generating device such that the x-ray tube is fixed in a pre-determined position with respect to the x-ray generating device.

22. An x-ray tube as defined in claim 21, wherein the curved second surface of the bracket portion is concavely shaped to mate with the correspondingly shaped exterior portion of the outer housing.

23. An x-ray tube as defined in claim 22, wherein the clamp portion has a “C”-shaped configuration.

24. An x-ray tube as defined in claim 23, wherein the surface of the annular ring that defines the clamp portion aperture further defines an annular ridge, the protruding portion of the cylindrical segment seating against the ridge when the protruding portion is received into the aperture.

25. An x-ray tube as defined in claim 24, wherein the clamp portion includes a screw hole that passes across the radial cut, the screw hole being configured to receive a tightening screw therein.

26. An x-ray tube as defined in claim 25, wherein the curved second surface of the bracket portion further includes a circular recess for receiving a portion of the clamp portion therein.

27. An x-ray tube as defined in claim 26, wherein the circular recess of the bracket portion is concentric with the aperture of the bracket portion.

28. An x-ray tube as defined in claim 25, wherein the clamp portion extends inward through the aperture defined in the outer housing toward a central portion of the outer housing when it is attached to the bracket portion.

29. An x-ray tube as defined in claim 28, wherein the clamp portion, the bracket portion, and the x-ray generating device are mechanically attached using screws.

WORKMAN NYDEGGER
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
1000 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

30. An x-ray generating device, comprising:

a device body; and

an x-ray tube including:

an evacuated enclosure containing an electron source and a rotary

anode positioned to receive electrons emitted by the electron source; and

a mounting assembly that attaches the x-ray tube to the device body,

including:

a bracket portion that mechanically attaches to a portion of the device

body; and

a clamp portion that frictionally engages a portion of the evacuated

enclosure proximate an x-ray transmissive window that is located on a

surface of the evacuated enclosure, wherein the clamp portion is also

mechanically attached to the bracket portion such that the mounting assembly

supports the evacuated enclosure in a specified position with respect to the

body.

31. An x-ray generating device as defined in claim 30, wherein the x-ray generating device is a medical imaging device.

32. An x-ray generating device as defined in claim 31, wherein the portion of the device body to which the bracket portion mechanically attaches is a gantry of the medical imaging device.

33. An x-ray generating device as defined in claim 31, wherein the x-ray generating device is a mammography device.

34. An x-ray generating device as defined in claim 30, wherein the x-ray tube further comprises an outer housing containing the evacuated enclosure, and wherein the bracket portion of the mounting assembly also attaches to a portion of the outer housing.

35. An x-ray generating device as defined in claim 30, wherein the x-ray generating device is used for diagnostic testing of the x-ray tube.

WORKMAN NYDEGGER
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
1000 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

36. a mounting assembly for use in attaching an evacuated enclosure of an x-ray tube to a device, the mounting assembly comprising:

a bracket portion that attaches to a portion of the device, the bracket portion including an aperture; and

a clamp portion that attaches to a portion of an x-ray transmissive window assembly of the evacuated enclosure, wherein the clamp portion also attaches to the bracket portion such that an aperture in the clamp portion is aligned with both a portion of the window assembly and the aperture of the bracket portion.